R E P O R T R E S U M E S

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AN 8-WEEK SUMMER INSTITUTE TRAINING PROGRAM TO RETRAIN OFFICE EDUCATION TEACHERS FOR TEACHING BUSINESS ELECTRONIC DATA PROCESSING.

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AN 8-WEEK SEMINAR WAS HELD TO RETRAIN TEACHERS WITH A MINIMUM OF 3-YEARS' EXPERIENCE IN BUSINESS OR OFFICE EDUCATION TO TEACH BUSINESS DATA PROCESSING AND PROGRAMING TECHNIQUES. THE OBJECTIVES WERE TO ASSIST IN THE KNOWLEDGE AND SKILL DEVELOPMENT NECESSARY FOR PREPARING COMPUTER PROGRAMERS AND APPLICATION ANALYSTS, AND TO DEVELOP COURSE MATERIAL, CONTENT, REFERENCES, VISUAL, AND OTHER INSTRUCTIONAL AIDS SUITABLE FOR USE AS PATTERNS AND GUIDELINES FOR FUTURE PROGRAMS. THIRTY FIRST-YEAR PARTICIPANTS RECEIVED INSTRUCTION IN BUSINESS DATA PROCESSING FUNDAMENTALS, ELECTRONIC ACCOUNTING MACHINERY FAMILIARIZATION, DATA PROCESSING APPLICATIONS, AND BASIC COMPUTER PROGRAMING. TWENTY SECOND-YEAR ATTENDEES RECEIVED ADVANCED TRAINING IN COMPUTER PROGRAMING, PROGRAMING SYSTEMS, AND BUSINESS SYSTEMS DESIGN AND DEVELOPMENT. IT WAS RECOMMENDED THAT A STUDY OF THE ACCOMPLISHMENTS OF PARTICIPANTS AT THEIR HOME INSTITUTIONS AS WELL AS FOLLOWUP WORK ON STUDENTS TRAINED BY THE PARTICIPANTS BE INITIATED. (HS)

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June 1, 1965 to December 31, 1965

Professor Forest C. Carter
College of Business
Colorado State University
Fort Collins, Colorado

Vocational and Technical Education Grant, Contract No. OE-5-85-085
Vocational Education Act of 1963, Section 4(c)

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PROJECT

In the past decade the computer and peripheral equipment have come into wide use in business organizations large and small as the primary tool in processing data. One result was the movement to include business data processing in curriculums in high schools, post-high school technical institutes, junior colleges, and four-year degree granting institutions. This action led to the need for determining courses and curriculum for the respective levels of education and the question of who would teach the courses.

The total impact of electronic data processing methods encompasses far more than merely processing business data. It has equally strong scientific applications. However, the focus of this project was in the problems related to providing student training in business data processing at the high school and post-high school vocational and technical level. The immediate short range problems were the shortage of qualified teachers and the lack of developed curriculum. These problems had to be solved if the educational opportunities were to be provided to students who wished to enter this field.

The major purpose of the institute, broadly stated, was to assist in developing the knowledge and skill essential for teaching specialized courses in preparatory curriculums in business electronic data processing under Federally-supported Vocational and Technical Education Acts.

There is an acute shortage of teachers for business data processing involving the use of computers and peripheral equipment. Regular pre-service teacher education programs have not been developed in this newly emerged field of instruction. The institute is an effort to meet the nation-wide demand for teachers.

A hypothesis of the project was that experienced and knowledgeable successful teachers in the field of office or business education could be quickly retrained through a series of specially designed summer courses in order to teach in the field of business data processing.

The College of Business at Colorado State University was one of the five institutions conducting these special summer institutes; the others were: Orange Coast College, Costa Mesa, California; Miami-Dade Junior College, Miami, Florida; Holding Technical Institute, Raleigh, North Carolina; and Milwaukee Institute of Technology, Milwaukee, Wisconsin.

Institutes had been conducted at all five schools during the summers of 1963 and 1964. Feedback from previous participants, state directors of vocational and technical education, and conferences with industry experts in the field indicated the programs should be continued.

OBJECTIVES

The specific objectives of the institute were listed in the proposal as follows:

1. To retrain teachers with a minimum of three years teaching experience in business or office education for teaching of

newly emerged business electronic data processing, computer programming.

2. To assist with the development of knowledge and skill essential for teaching specialized courses in curriculums designed to prepare computer programmers and/or application analysts.
3. To further develop suggested course material including course content, references, visual and other instructional aids suitable for use as patterns and guidelines for future programs.

PROCEDURES

The institute was held on the campus of Colorado State University at Fort Collins, Colorado. It was eight weeks in length and designed for a total of 50 participants, 30 first-year and 20 second-year. The institute consisted of first-year and second-year courses with the content designed specifically to meet the needs of the participants in the subject areas of Introduction to Business Data Processing, Electronic Accounting Machines, Data Processing Applications, and Computer Programming I (first-year courses); Computer Programming II, Programming Systems, Business Systems Design and Development, and Advanced Programming Systems (second-year courses). In addition, first-year students and those of the second-year who needed it took a course in Philosophy and Principles of Vocational Education.

COURSE CONTENT

Separate classes were conducted in each of the institutes for first-year participants and for second-year enrollees. Instructional procedures for both groups included the following:

Lecture
Lecture-laboratory
Actual work on equipment
Observation of data processing procedures in business
Wiring of programs
Writing programs
Committee work
Oral and written reports
Discussion sessions
Seminars

A brief description of the courses as they appeared in the project proposal are listed as follows:

A. First-Year Participants

1. Introduction to Business Data Processing:

   A study of the development of computer systems from manual methods to stored programs. Designed to provide a foundation for detailed study of specific systems.

2. Electronic Accounting Machines:

   A survey of electric accounting machines, illustrating the need for machines in accounting and record keeping and the concept, power, and flexibility of the unit record. The importance and scope of unit record equipment as an independent system will be developed throughout the course. Laboratory exercise will be executed involving planning and wiring a range of unit record equipment. Practical exercises offered will be typical of those performed in the existing electric accounting machine installations.

3. Data Processing Applications:

Designed to acquaint the participant with business data processing applications; practical case studies illustrate the use of data processing equipment in various types and sizes of representative companies.

4. Computer Programming I:

Consideration of the function and capabilities of a specific data processing machine and the tools and raw materials necessary for becoming a programmer. Participants will perform programming drills, exercises, and case studies which will serve to bridge the gap from the theoretical to the real world of data processing.

B. Second-Year Participants

1. Computer Programming II:

A continuation of Computer Programming I. The principles presented in the first-year course will be employed repeatedly. Programming the tape data processing system will be taught as well as the fundamentals of random access programming.

2. Programming Systems:

An introduction to programming systems to familiarize the student with the purpose and function of the various types of systems.

3. Business Systems Design and Development:

Designed to guide the student through the three stages in the evolution of a system; analysis of present information flow; system specifications and equipment selections and implementation of the system.

4. Advanced Programming Systems:

Efforts will be made to provide the student with sufficient knowledge of programming systems concepts so that he may master any specific system with a minimum of instruction. Furthermore, he should be qualified to analyze, evaluate, and make minor modifications to such systems.

The courses described above were grouped in the following university course number and titles for those students who desired to take the work for credit.

First-Year Courses:

VE 103	Philosophy of Vocational Education	3 credits
VE 125	Methods in Teaching Computer Techniques	4 credits
VE 126	Methods in Teaching Unit Record Equipment	5 credits
	Total	12 credits

Second-Year Courses:

M 115	Advanced Computing	3 credits
M 116	An Introduction to Computer Systems	3 credits
Bu 180	Data Processing for Decision Systems	3 credits
Bu 181	Analytical Decision-Making in Administration	3 credits
	Total	12 credits

A participant could enroll in a total of 12 credits each summer.

The course schedule for each year called for an average of 35 contact hours per week. The schedules for the classes are shown in Exhibits I and II in the Appendix.

Course outlines are found in the Appendix Exhibits III through VI. In the second-year program the courses were integrated and taught in pairs, i.e., M 115 and 116; Bu 180 and 181.

The participant could enroll for either credit or audit. Forty-three enrolled for credit. A total of twelve quarter credits could be earned in the eight weeks. All participants successfully completed the courses.

EVALUATION

Instructor Comments. Evaluation meetings were held throughout the institute and each instructor presented a written analysis of their experience. The following represent a composite of their comments. The complete evaluation of two of the staff are included in the Appendix Exhibits IX, X, and XI.

The instructors generally agreed that the selection of the participants was very good. In one case there was a failure on the part of the state director and the director of the institute to adequately screen the application. Therefore, one person did not have the adequate background. The content of the first-year program was considered to be more than adequate. The major problem was to develop the level of knowledge for the participants to a point where they would have confidence to return to their home institutions and teach the material in the fall quarter. If we are to offer the institute again, we would propose to start teaching 1401 language during the first year. Our physical set up includes both the IBM 1620 and 1401 computers. We have used the 1620 for the first year and the 1401 for the second year. The instructors agree that we should be teaching the 1401 language even if we are going to continue to use the 1620 as a teaching device for the first-year participants. This would permit more time to be spent on the teaching of tapes and disks and other programming systems in the second year. A morale problem has been observed among the participants during the seventh and eighth weeks. This has apparently arisen because we have placed such a heavy work load on the students. With

seven contact hours a day and often several hours of homework, the pressure began to build towards the end of the institute. It would seem appropriate to reduce the amount of contact hours placing more responsibility on the participants to study and develop their knowledge of the material outside of the formal classroom. The consensus of all of the staff involved in the institute was that we accomplished our purpose for both the first and second year groups.

Student Comments. A review of the institute programs after three summers reveals that office or business education teachers make excellent trainees in the data processing field. With their background in business and related subjects, business education teachers easily grasp the relationships or applications of data processing to business.

Our first-year program prepared teachers in basic unit record equipment, computer operator, and the philosophical principles of vocational education. The second-year program stressed programming, computer techniques, and business systems; with special emphasis on materials or problems for practical classroom use. Although students complained of long hours in class, the follow-up reveals that they were appreciative of the skills and knowledges obtained. Exhibit XII illustrates the students' opinions on the organization of both the first and second year programs.

Students appeared to be pleased with not only the content of the programs but with the length, materials used, methodology, and administrative practices. Instruction was rated very good in both programs except for one situation and that has been taken care of for this summer.

In reviewing the students' evaluations and follow-up correspondence, it could be stated that both programs were a definite success and very beneficial to teachers in the field of data processing.

SUMMARY AND RECOMMENDATIONS

In conclusion, it is our opinion that the institute was very successful. The evaluations by both the instructors and the students indicate the accomplishment of the objectives. We would recommend the continuation of the institutes, particularly until such time as colleges and universities throughout the country include the knowledge necessary for teaching business data processing in their regular teacher preparatory curriculums.

We recommend that a study be made of the accomplishments of the participants in their home institutions; that is, have they been able to develop courses and curriculum and have it included in the offerings of their institutions. Further, it would be very valuable to do some follow-up work on students the participants have trained, particularly to evaluate the success or failure of these students in obtaining and holding positions in the business data processing industry.

APPENDIX

1965 Summer Schedule

First-Year Summer Data Processing Institute

Time	Room	Mon.	Tues.	Wed.	Thurs.	Fri.	
7:00	U. R. 1620 Wire	Sec. A Sec. B Sec. C	→	→	→	Open Lab All Students	a) First two weeks 1620 lab will be demonstration and on a closed shop basis. b) Entire class divided into three equal groups for laboratory hours; designated as Sec. A, B, and C.
8:00	U. R. 1620 Wire	Sec. B Sec. C Sec. A	→	→	→		
9:00	U. R. 1620 Wire	Sec. C Sec. A Sec. B	→	→	→		
10:30	120 Jsn.	VE 125	VE 125	VE 125	VE 125	VE 125	
12:00		↓	↓	↓	↓	↓	
1:00	120 Jsn.	VE 103	VE 103	VE 103	VE 103	VE 103	
2:00	120 Jsn.	VE 126	VE 126	VE 126	VE 126	VE 126	
3:30		↓	↓	↓	↓	↓	

Exhibit I

Exhibit II

1965 Summer Schedule

Second-Year Summer Data Processing Institute

Time	Room	Mon.	Tues.	Wed.	Thurs.	Fri.
7:30	1620 1401	1620* 1401**	1620 1401	1620 1401	1620 1401	1620 1401
8:00	1620 1401	↓	↓	↓	↓	↓
9:00	1620 1401	↓	↓	↓	↓	↓
10:00	135 Jsn.	M 115	→	→	→	→
11:00	135 Jsn.	M 116	→	→	→	→
12:00						
1:00	135 Jsn.	Bu 180	→	→	→	→
2:00	135 Jsn.	Bu 181	→	→	→	→
3:00	135 Jsn.		Bu 181		Bu 181	
4:00	135 Jsn.		↓		↓	

*First 2 weeks on 1620 - hands on time

**Last 6 weeks on 1401 - open shop basis

Exhibit III

VE 125 Methods of Teaching Computer Techniques

Course Outlines and List of Handouts

I.	COMPUTERS IN GENERAL	3 days
	1. Historical Development of Computers both Digital and Analog	1/2 hour
	2. Components or basic building blocks of digital computers	1 hour
	a. Input units b. Control units c. Memory units d. Arithmetic units e. Output units	
	3. Basic concepts of digital computers	1/2 hour
	a. Stored program b. Addressing c. Rules of operation d. Yes, no decisions	
	4. Numbering Systems	2 hours
	a. Decimal b. Binary c. Octal d. Others	
	5. Data representation in digital computers	1 1/2 hours
	a. Bit configurations b. Internal checking	
	6. Flow Charting symbols	1/2 hour
II.	1620 MACHINE LANGUAGE PROGRAMMING	3 weeks
	1. The 1620 Data Processing System	2 hours including lab visit
	a. Input/Output unit 1622 b. Console lights and switches	

VE 125

c. Arithmetic unit
d. Memory
e. Other on-line u
f. Bit configuratio

2. Instructions — 1/2 hour

a. Instruction format
b. Storage of instructions
c. Addressing instructions

3. Data — 1/2 hour

a. Fields
b. Records
c. Addressing

4. Special Storage areas in the 1620 — 1/2 hour

a. Load area
b. Product area
c. Arithmetic tables
d. Record mark
e. General storage

5. Input-Output Commands — 3 hours

a. Alpha Mode versus Numeric Mode
b. Q-modifiers to determine I/O device
c. RN--Read numeric
d. WN--Write numeric
e. RA--Read alphameric
f. WA--Write alphameric
g. K--Control of console typewriter
h. Exercises and Lab demonstration

6. Program Control Commands — 1/2 hour

a. H--Halt
b. SF--Set Flag
c. CF--Clear Flag
d. NOP--No operation

7. Unconditional Branch — 2 hours

a. B - Branch
b. Looping
c. Exercises and Lab

VE 125

8. Loading The Program — 2 hours

   a. Console operation
   b. Load instructions
   c. Loading from the typewriter
   d. Loading from cards
   e. Exercises and Lab demonstration

9. Conditional Branches — 4 hours

   a. BI--Branch on indicator
   b. BMI--Branch no indicator
   c. Program switches 1-4
   d. H/P--High positive indicator - 11
   e. E/Z--Equal zero indicator - 12
   f. H/P or E/Z indicator - 13
   g. Exercises and Lab

10. Basic Arithmetic Commands — 1 hour

   a. A--Add
   b. S--Subtract
   c. Flags
   d. Restrictions
   e. Exercises

11. Internal Transmission Commands — 1 hour

   a. TD--Transmit Digit
   b. TDM--Transmit digit immediate
   c. TF--Transmit field
   d. TFM--Transmit field immediate
   e. TR--Transmit record
   f. Exercises

12. Immediate Arithmetic Commands — 1/2 hour

   a. AM--Add immediate
   b. SM--Subtract immediate
   c. Exercise

13. Review exercise with lab — 2 hours

14. Compare Commands and Indicators — 2 hours

   a. C--Compare
   b. CM--Compare immediate
   c. Use of indicators: H/P, EZ, EZ or H/P, OFLO
   1. Exercises

VE 125

15.	Address Modification and Loops	2 hours
	a. Arithmetic to change instructions	
	b. Planning the loop	
	c. Ending the loop	
	d. Exercises	
16.	Program Flow Charting	1/2 hour
	a. Illustration	
17.	Alpha Mode and Arithmetic	2 hours
	a. Stripping and filling	
	b. Special TNF and TNS commands	
	c. Exercises	
18.	Other 1620 Commands	4 hours
	a. Dump numeric	
	b. Move flag	
	c. Multiply	
	d. Multiply immediate	
	e. Division--LD, D, LDM, DM	
	f. Conditional branch--BD, BNF, BNR	
	g. Exercises	
19.	Subroutines	2 hours
	a. Purpose	
	b. Linkage	
	c. BT--Branch and Transmit	
	d. BTM--Branch and Transmit Immediate	
	e. BB--Branch Back	
	f. Exercises	
20.	Numeric Blanks	1/2 hour
21.	Indirect Addressing	1 1/2 hours
III.	1620 SYMBOLIC PROGRAMMING SYSTEM	2 weeks
A.	Introduction to SPS	1 hour
	1. Mnemonics for Instructions	
	2. Symbols for addresses	
	3. The assembly program	

VE 125

B. SPS for the 1620

1. Coding Basic Parts — 1 1/2 hours

   a. Labels
   b. Operation codes
   c. Operands and remarks for instructions
   d. Asterisk in instructions

2. The location counter — 1/2 hour

3. Address arithmetic — 1 hour

   a. Exercise

4. Declaratives — 6 hours

   a. DORG
   b. DEND
   c. DS
   d. Exercises
   e. Asterisks for declaratives
   f. DC
   g. DSS
   h. DSC
   i. DAS
   j. DAC
   k. DSA
   l. DSB
   m. DNB
   n. TCD
   o. TRA
   p. Exercises

5. Operating the assembly program — 2 hours

   a. Exercises in lab

6. Illustrative program — 4 hours

   a. Flowcharting
   b. Coding
   c. Processing
   d. Testing and Debugging

7. Program assignment — 4 hours

   a. Same steps as above

VE 125

IV. FORTRAN -- FORMULA TRANSLATION — 2 weeks

A. BASIC 1620 FORTRAN

1. The Fortran Compiler — 1/2 hour
2. Procedure to solve problems using Fortran — 1/2 hour

   a. Statements
   b. Source Program
   c. Object Program

3. Constants — 1/2 hour

   a. Fixed point
   b. Floating point
   c. Limitations

4. Variables — 1/2 hour

   a. Naming
   b. Rules for using

5. Operations — 1/2 hour

   a. Addition +
   b. Subtraction -
   c. Multiplication *
   d. Division /
   e. Exponentiation **

6. Expressions — 1/2 hour

   a. Combination of operations
   b. Rules for use of
   c. Examples

7. Input and Output Statements — 1 hour

   a. Read and Format
   b. Punch
   c. Print
   d. Pause
   e. Stop
   f. End
   g. Sample program

8. Using the Fortran Compiler — 1 hour

   a. Explanation and demonstration

VE 125

9. Arithmetic Statements — 1 hour

   a. Format
   b. Use of equal sign
   c. Fortran arithmetic
   d. Mathematical Functions

      (1) SQRTF
      (2) EXPF
      (3) SINF
      (4) COSF
      (5) ATANF
      (6) LOGF
      (7) ABSF

   e. Examples of use of

10. Transfer of control — 1 hour

   a. The GO TO statement
   b. The IF statement
   c. Computed GO TO statement
   d. Exercises

11. Subscripted Variables — 1/2 hour

   a. Arroys
   b. Examples of subscripts

12. DIMENSION Statement — 1/2 hour

   a. Use of
   b. Examples

13. The DO statement — 1 hour

   a. Rules for use
   b. Examples

14. Programs in Fortran — 5 hours

   a. Examples of programs to solve some business problems

15. Program assignments — 6 hours

   a. To be combined with above

VE 125

HANDOUT MATERIALS

1. Course outline - 7 pages
2. Number Systems - 1 page
3. Program flowchart symbols - 1 page
4. 1620 Instructions and Operation Codes - 1 page
5. Exercises one through five - 1 page
6. Exercises six through eight - 1 page
7. Operating notes for 1620 and 1622 - 1 page
8. Card-Reader and Punch feed diagram - 1 page
9. Exercise 9 - review exercise - 2 pages
10. Exercise 9 solution - 1 page
11. Comparing and Compare Instruction and Exercises 10 and 11 - 3 pages
12. Supplementary Exercises S1 and S2 - 1 page
13. Address modification and loops - 2 pages
14. Flow chart of practice exercise in address modification and loops - 1 page
15. Coding for above exercise - 1 page
16. Exercise 12 - 1 page
17. Exercise 12 - solution - 1 page
18. Alphameric mode and arithmetic and exercise 13, 14, 15 - 4 pages
19. Fee total program exercise - 1 page
20. Supplementary exercises S3, S4, S5 - 1 page
21. 1620 Memory Dump Program - 2 pages
22. Multiply and Divide commands - 5 pages
23. Special branch instructions and subroutines - 4 pages
24. Exercise 16 - 1 page
25. Symbolic programming - 1 page
26. Lab procedure for running SPS programs - 1 page
27. Supplementary exercises S6 and S7 - 1 page
28. Report Head Count by Program Exercise - 1 page
29. Exercise 17 - 1 page
30. Exercise 18 - Input/Output in FORTRAN - 1 page
31. Exercise 19 - Grade Point Average in FORTRAN - 1 page
32. Exercise 20 - Compound Interest in FORTRAN - 1 page
33. Exercise 21 - Standard Deviation in FORTRAN - 1 page
34. DP Definitions - 2 pages
35. Final Examination - 4 pages
36. Final Examination Key - 3 pages

VE 125

MATERIAL COVERED IN CLASS

The material covered in class can be broken down into three parts:

1. 1620 Machine Language Programming:

   Students were taught basic concepts of computers and of programming. Material covered included such topics as the stored program, input-output, the commands for the IBM 1620 computer and how to use them in programs, some techniques such as address modification and loops, use of subroutines, flow charting, debugging programs, and how to operate the 1620 computer system.

2. 1620 Symbolic Programming System (SPS)

   This was an introduction to symbolic programming in which students were taught to use SPS and to write simple programs so that they could become familiar with programming and operating an assembly-type programming system.

3. 1620 FORTRAN II

   Students were taught the basic concepts of a compiler programming system. Exercises were used which stressed the capabilities of the FORTRAN programming system, and students learned to use the FORTRAN compiler.

Exhibit IV

VE 126 Methods of Teaching Unit Record Equipment

Course Outline

I. THE CARD

A. Columns

B. Zones

C. Alphabetic punching

D. Numeric punching

E. Special characters

F. Fields

G. Layouts

II. CARD-PUNCH

A. Operating features

1. Program card
2. Program drum

B. Operations

1. Inserting cards manually
2. Numerical punching with program control
3. Alphabetic and numerical punching with program control
4. Error correction
5. Duplication

C. Program card preparation

III. SORTER

A. Types of machines

1. 082
2. 083

B. Numeric sorting

C. Alphabetic sorting

D. Block sorting

IV. INTERPRETER

A. Normal printing

1. Interpret reading
2. Print entries
3. Zero-print control
4. Column split
5. Selectors
6. Control X and 12 punches

B. Wiring

V. DOCUMENT-ORIGINATING MACHINE

A. Components and features

1. Control panel
2. Operating keys, switches and signals
3. Card feed units

a. Read unit

1) RX brushes
2) Reproducing brushes
3) Comparing and transcribing brushes

b. Punch unit

1) PX brushes
2) Punch station
3) Gangpunching and interpreting brushes
4) Print unit

B. Comparing

C. Reproducing

D. Gangpunching

E. End printing

F. Summary punching

VI. COLLATOR

A. Components and features

1. Control panel
2. Operating keys, switches and signals
3. Card-feed units

a. Primary feed
b. Secondary feed

B. Merging

C. Matching

D. Merging-matching

E. Selection

VII. ACCOUNTING MACHINE

A. Features and functions

1. Feed unit
2. Print unit
3. Operating keys, switches and signals
4. Control panel

B. Printing

1. Detail printing
2. Character-emitter printing
3. Print selection
4. Offset total printing
5. Group indication
6. Total transfer
7. Zero-print control

C. Tape control

1. Space control
2. Control tape preparation
3. Platen
4. Bars
5. Inserting tape
6. Form control
7. Ribbon replacement

D. Multiple-line reading operations

1. Address printing
2. Heading cards
3. Printing more than three lines from one card

E. Arithmetic operations

1. Addition
2. Subtraction
3. Counter coupling

F. Selectors

1. X selection
2. Digit selection
3. Multiple X or digit selection

G. Storage units

H. Summary punching

M 115 and 116 Advanced Computing

Course Outlines, Schedule of Material Covered and Accomplishments

Date	Course Content	Completed
June 21	Introduction to 141 and 1401 languages. Simulation of 1401 language on 1620 computer.	
June 22	Presentation of machine language (absolute) on the 141. Operation codes for: Word Mark Instructions Input-Output Instructions Move Operations Arithmetic Operations Compare Test and Branch Instructions	Program written 3rd day of class. Program run on 1620 - 4th day.
June 28	Presentation of SPS language (all operation codes listed above). Declarative commands	Programs in SPS run in 2nd week.
July 6	Presentation of 1401 SPS language. Operation codes same as those listed above plus Address Modification Instructions Editing for Numerical fields Miscellaneous Instructions Indexing	Transfer of 141 to 1401 programs. Debugging delayed during 3rd and 4th weeks.
July 12	Instructions to accomplish following computer functions: Crossfooting Program Control Selections of X's, fields, digits, etc.	Debugging caught up during 5th and 6th weeks.

M 115 and 116

Date	Course Content	Completed
July 12 (con't)	Carriage Control Checking data validity - hash totals, etc. Checking internal computation	
July 19	Autocoder language presented Format, coding and declaratives Comparative analyses of languages. Note: Most students rewrote problems 13 and 14 in autocoder.	Several students used auto coder in final program.
July 26	Presentation of Magnetic Tape instructions Writing Reading Validity checking of tape - error routines, etc. Note: Almost all students used tape on problems 13 and 14	Individual final programs assigned. Mostly completed last day.
Aug. 2	Disk operations presented Read Write Checking validity of disk	Students used disk storage in their final programs.

M 115 and 116

MATERIALS USED:

Text: Swallow & Price "Elements of Computer Programming."

This new publication proved very valuable. It is easy to read and students readily accept this text for this reason. The instructor participated in the formation of this text and was extremely cognizant of text content.

IBM reference material consisted of their several publications on the IBM 1401.

Student handouts as follows:

141 Course Outline

141 Outline Class Notes for Students

141 Language Instruction

1401 SPS Instruction Codes

1401 Declarative Statements

1401 Indexing

1401 Autocoder Codes

1401 Autocoder Instructions

1401 Autocoder Processor

1401 Tape Processing

1401 Disk Storage Programming

1401 Macro Instructions

141 & 1401 Assignments

14 Problems

Final Project

Sample Test

Final Exam

Exhibit VI

Bu 180 and Bu 181

Course Content

The purpose of Bu 180 and Bu 181 was adequately served this summer by exposing the student to the functions of a business organization and the interrelationship of the organization and data processing.

The course content included lecture and demonstrations in the following areas:

1. Management and Systems
2. Organization Concepts and Design
3. Systems Functions, Concepts and Programs
4. Flow Charting
5. Form Control and Design
6. Systems Analysis
7. PERT: A Management Organizing and Evaluation Tool
8. Introduction to COBOL
9. Introduction to IBM 360 System

These areas were discussed and subject to critical analysis and placed within their proper perspective as they related themselves to the business world.

A comprehensive study dealing with the functional areas of a business enterprise was completed by the class. This allowed the students to apply the knowledge gained in the formal classroom situation to a practical situation. The problem was of sufficient magnitude that the student could experience the frustrations of working with other people, the clashing of thoughts and ideas and the difficulty encountered in establishing the required communication network of a firm.

Bu 180 and Bu 181

PERT was demonstrated to the class an an example of a model integrated system. Several inventory models were also used to illustrate the total systems concept. Several days were spent in an orientation program regarding the COBOL programming system.

During the last week, students prepared a lecture covering the various facets of the IBM 360 system. Each student prepared a different topic. The purpose of introducing this into the curriculum was to familiarize the student with terminology and to give the student an insight into future educational requirements.

Exhibit VII

Statistical Summary Report
Business Data Processing Teacher Education Summer Institute
Colorado State University, Fort Collins, Colorado
July 21 - August 13, 1965

1. Director: Dr. Forest C. Carter
Head, Department of Business
Colorado State University

2. Staff Members:

Mr. Carl T. Reich
Instructor, Business Data Processing
Monterey Peninsula College
Monterey, California

Mr. William C. Piquette
Instructor, Business
Otero Junior College
La Junta, Colorado

Mr. Donald W. Campbell
Instructor
Department of Business
Colorado State University
Fort Collins, Colorado

Mr. A. C. Masterson
Instructor
Department of Business
Colorado State University
Fort Collins, Colorado

Dr. Gordon G. McMahon
Associate Professor
Department of Vocational Education
Colorado State University
Fort Collins, Colorado

Dr. John Staples, a member of the Department of Business staff, and Howard Zach, a graduate student and participant in the second year program, served as laboratory assistants.

3. Enrollment:

a. A total of 44 participants were enrolled.

b. First Year - 25 Second Year - 19

c. States Represented:

State	# of Participants
Colorado	11
Kansas	2
Maryland	1
Massachusetts	1
Nevada	1

North Carolina	1
South Dakota	1
Texas	25
Wisconsin	1

d. All of the participants expected to teach business data processing courses during the 1965-66 school term.

4. First Year Participants - 7 Contact Hours Per Day
Second Year Participants - 7 Contact Hours Per Day

5. College Credit:

a. Granted by Colorado State University

b. Credit was earned by 43 of the participants.

c. Twelve credits were granted for the 8 weeks term.

6. A certificate of recognition was given to the fir . and second year participants.

7. Budget for Conduction of the Institute:

a. Total Cost - $58,409

b. Cost of Instruction - $33,474

c. Travel to Evaluation and Planning Meetings - $1,062

d. Maintenance and Travel of Participants - $24,935

e. Federal Funds - $48,966

f. State and Local Funds - $9,443

8. Assistance received from Manufacturers:

General Electric furnished us a publication - You and the Computer: A Student's Guide, 1965.

9. No special seminars were held.

10. Plant Visitations and Tours:

Statistical Summary Report

First Year Participants
IBM Service Bureau - Denver, Colorado
First National Bank - Denver, Colorado
Air Force Academy - Colorado Springs, Colorado
Adolph Coors Company - Golden, Colorado

Second Year Participants
Adolph Coors Company - Golden, Colorado
Forney Industries - Fort Collins, Colorado

11. "Take Home" Instructional Materials Provided Participants:

First Year
Outlines for Teaching Unit Record Equipment
Bibliographies for References
Overhead Projection Foils for Instructional Purposes
Diagrams and Decks of Cards for Types of Problems on all Unit Record Equipment

Second Year
Integrated Manufacturing Information System
A Series of Machine Program Layouts
IBM 402 and 403 Program Teaching Package

12. Other Activities:

Four social activities were held in which both first and second year participants were joined together.

a. Two evening mixers

b. Mountain picnic

c. Family reception and presentation of certificates

Exhibit VIII

Participants in the 1965
Business Data Processing Teacher Education Summer Institute
Colorado State University
Fort Collins, Colorado

FIRST YEAR

Name	School Affiliation
Arthur, Lina L. (Mrs.)	Greeley Central High School Greeley, Colorado
Bankhead, Leander J.	Paris Junior College Paris, Texas
Bartlett, Robert L.	Colorado State University Fort Collins, Colorado
Baxter, Ida Mae (Mrs.)	Southwest Texas Jr. College Uvalde, Texas
Beard, Joyce J. (Miss)	Ft. Worth Technical High Fort Worth, Texas
Bell, Paula E. (Miss)	South Plains College Levelland, Texas
Brandon, Carolyne V. (Mrs.)	Loveland High School Loveland, Colorado
Bunney, Shirley A. (Mrs.)	Colorado State university Fort Collins, Colorado
Dillaha, Alton R.	Wharton County Jr. College Wharton, Texas
Fuller, Paul C.	Weatherford College Weatherford, Texas
Johnston, Marvin A.	Texas Technological College Lubbock, Texas
Jordahl, Ellen B. (Miss)	San Jacinto College Pasadena, Texas
Jowdy, Earle E.	Plymouth-Carver High School Plymouth, Massachusetts

FIRST YEAR (con't)

Name	School Affiliation
Kohlman, Harold W.	San Antonio Junior College San Antonio, Texas
Lohrey, Ilah F. (Mrs.)	Westminster High School Westminster, Colorado
McConnell, Lee U. (Mrs.)	Otero Junior College La Junta, Colorado
Miller, Martha A. (Miss)	Panola College Carthage, Texas
Pollock, Guy W.	Pasadena Senior High School Pasadena, Texas
Rhodes, Elizabeth J. (Miss)	Ft. Worth Technical High Fort Worth, Texas
Stockton, Willis H.	San Angelo Central High San Angelo, Texas
Swinney, Helen E. (Mrs.)	Washoe County School District Reno, Nevada
Trujillo, Milton M.	Fort Hays Kansas State College Hays, Kansas
Yeary, James D.	South Plains College Levelland, Texas
Yetka, Alice M. (Miss)	Colorado State College Greeley, Colorado

SECOND YEAR

Anderson, Gerald H.	Lamar Junior College Lamar, Colorado
Baer, Justin F.	South Hagerstown High School Williamsport, Maryland
Bratton, Roy H.	Cisco Junior College Cisco, Texas
Bramlett, Byron D.	Navarro Junior College Corsicana, Texas

SECOND YEAR (con't)

Name	School Affiliation
Garcia, Eduardo F.	Laredo Junior College Laredo, Texas
Hanke, John E.	Otero Junior College La Junta, Colorado
Hardy, Arthur L.	San Jacinto College Pasadena, Texas
Knowles, Michael J.	Grayson County College Denison, Texas
Laxson, Homer C.	San Angelo College San Angelo, Texas
Locke, Gerald W.	Grayson County College Denison, Texas
Martinez, Jr., Mercurio	Laredo Junior College Laredo, Texas
Nash, Dallas L.	Abilene Senior High School Abilene, Texas
Perry, Howard L.	Black Hills State College Spearfish, South Dakota
Plunkett, Robert A.	S. F. Austin High School Austin, Texas
Rothenbach, George J.	Eastern Kentucky State College Richmond, Kentucky
Teglovic, Jr., Steve	Southern Colo. State College Pueblo, Colorado
Walden, J. B.	Ft. Hays Kansas State College Hays, Kansas
Zach, Howard L.	Colorado State University Fort Collins, Colorado

Exhibit IX

TO: Forest Carter 8/10/65

FROM: Don Campbell, Institute Instructor

SUBJECT: SDPI Evaluation

This year all students in the second year were not only taking the course work for teacher trainee purposes, but also for graduate credit. It is my feeling that we are allowing persons to enter graduate school via a back door for which we may regret at a later date. If these courses are going to carry graduate credit, it is my recommendation that the graduate school requirement be superimposed upon the institute requirements. This would include enrollment in the graduate school prior to attending the summer session. For those students not wishing graduate credit, the course content would remain the same--only the entrance requirements altered.

I also might suggest that in the first year that a orientation course be included in the curriculum. This would be a course covering the entire spectrum of the data processing field. I feel that this would place data processing within the proper prospective as related to a business operation. The course might be two weeks in duration running four hours a day. I believe a student should see the entire spectrum before being weighted down with the nuts and bolts details of the hardware.

Again this year we had the usual seventh and eighth week breakdown in morale. The morale problem was further magnified by the

unfortunate delay in subsistence payments. Other than this observation, I have little to offer as a solution to the morale problem.

The field trips I felt were of little educational significance; however, they do break-up the daily grind. What their actual value is can be questioned.

In retrospect, from my vantage point, the institute was successful and considerable knowledge has been acquired by the students.

Exhibit X

TO: Dr. Forest Carter and Dr. Deane Carter 8/10/65

FROM: Bill Piquette, Institute Instructor

SUBJECT: Evaluation of 1965 Business Data Processing Summer Institute

Criterion for Admission: With but a few exceptions, the selection of candidates was very good. It seems that in only one instance was there a complete failure on the part of one of the candidates, and the person involved did not seem to put forth the effort required to master a difficult subject. The majority of persons in the first-year program have done excellent work, have been very cooperative, and have learned a great deal.

Content of Course: A great deal of material has been covered in the computer programming class the first year. First, we covered 1620 machine language, then SPS, and finally FORTRAN. However, the 1620 requires a great deal of machine detail study along with the basic programming concepts and techniques. This machine detail slows down the progress that could be made if it could be reduced or eliminated.

Suggested Changes: Therefore, I would like to suggest that the 1401 language be taught during the first year. The 1620 can be used to simulate the 1401, thus it is not necessary to use the 1401 for both the first-year and second-year groups. To simulate the 1401, a simulator program has been written and is available for general use. While it is somewhat limited, it is an excellent device to teach programming concepts and techniques. Both machine language and SPS can be taught with this simulator. The big advantage of the

simulator is that it eliminates a great deal of the machine detail involved when using 1620 language.

A further advantage would be that during the second year, less time would need to be spent on learning a new computer language since the 1401 itself is used the second year. More time could be spent teaching the use of tape and disk as well as other programming systems such as Autocoder, Report Generators, FORTRAN and COBOL.

Cooperation of Stat Lab: The stat lab personnel have been very cooperative. At no time have I had any difficulty whatsoever. None of the students in the first year group have had serious complaints. They seemed quite pleased with the laboratory arrangements. Naturally, it would be nice to have machines available for demonstration during class lectures, but under the circumstances, lab has worked out very well indeed.

Apprenticeship Program: I did not have an opportunity to use the apprenticeship program. From what I observed, it did not work out too well. However, with some organization I believe it could be used to advantage.

Suggestions for Future: As I indicated above, I think that the place to teach the tape and disk concepts as well as programming systems is in the second year. The use of tape and disk involve new concepts which need to be developed. Anyone teaching in the technical part of a data processing program needs to know of the different programming systems and their advantages and disadvantages. These things could be covered thoroughly if the DPSI program is changed as suggested above under the heading Contents of Course.

As part or all of a third-year program, it would be a help to many persons to have an opportunity to work in a DP installation in industry for a summer. I don't know what interest there would be from participants, but it might be worthwhile to see what could be worked out.

Supporting Help: The lab assistance I have had has been excellent. Howard is very good. Likewise, Donna and the others in the office have done an excellent job this summer.

Teaching Interest Next Year: As far as I can tell at this time, I would be interested in teaching in the institute again next summer.

Exhibit XI

TO: Dr. Forest Carter and Dr. Deane Carter 8/10/65

FROM: Bert Masterson, Institute Instructor

SUBJECT: An Evaluation of Methods of Teaching Unit Record Machines in the Business Data Processing Summer Program

I believe that the selection of the students for the program, by enlarge, has been satisfactory. There have been some cases where students have been admitted into this course who should not have been admitted. The 1965 class was, as a whole, suited to a beginning program in Unit Record.

The background of the students in the 1965 class, with the exception of one, was adequate to meet the requirements of the course. I believe that all benefited from the course. Since it was taught for the benefit of the beginner, it was not particularly beneficial to those who have had IBM schooling and teaching experience in this subject. However, many who have had IBM training did not have it on all of the equipment which we use in this program. Consequently, it is difficult to deny these people training that they need in order to be effective in the classroom.

My observation of the personnel in the statistical lab is that they have been very cooperative this summer. Our work has been primarily with Marilyn Doig, and I feel that she has been helpful in seeing that our needs in the Unit Record room have been adequately met. Since we had ground rules at the beginning of the program and all parties understood the rules, it made for a very pleasant summer.

It has been a pleasure working with the teachers and staff in this institute. I am sure that the interchange of ideas and suggestions has contributed to making this a very pleasant summer experience.

The suggestions that I submit for the first-year program are:

1. Afternoon labs and morning lectures, if possible.

2. Provide other related courses for students who desire only programming or Unit Record.

3. Drop the graduate credit for the first year and offer it for undergraduate credit. (Especially Unit Record)

4. Encourage the Colorado State Office to notify more Colorado teachers of the program. (We had seven in the beginning program this summer, which was an improvement.)

5. Have an instructor evaluation after the first three weeks and again toward the end of the program. This should give the instructor an opportunity to make any necessary changes that would benefit the students and upgrade the program.

I feel that even though these suggestions cannot be incorporated into any future programs, we have a very good one.

I have enjoyed and appreciated teaching in the Summer Institute, and I would very much like to continue teaching the same course providing the student evaluations justify it.

Exhibit III

Evaluation of the Summer Data Processing Institute

By Participants

Summer Program 1st Year/2nd Year	Very Good	Satisfactory	Adequate	Less Than Adequate	Needs Improvement
Length (In Weeks)	6/2	10/10	5/5	0/1	1/0
Scheduling (Hourly)	2/1	5/4	8/3	1/2	1/0
Content (Course Sequence)	12/4	9/3	1/7	0/2	0/2
Study Time	4/0	6/1	7/3	3/2	3/0
Laboratory Time	3/1	7/3	9/3	0/4	3/5
Work Load (Assignments)	7/1	8/6	3/4	0/3	3/4
Testing Procedures	6/0	12/10	3/5	0/0	1/4
Instruction	17/1	6/3	0/4	0/4	0/4
Textbook Materials	8/1	8/7	4/6	0/1	3/2
Supplemental Materials	12/4	7/5	5/4	0/2	0/1
Instructional Methods	16/0	5/3	2/5	0/3	0/5
Extra-Curricular Activities	18/5	1/6	4/3	0/1	0/1
Registration Procedures	17/10	4/5	3/1	0/0	0/0
Housing	12/7	6/6	3/0	1/0	0/2